

## CHAPTER 2

### 2.0 Introduction

This chapter reviews literature that is related to the teaching of critical thinking skills. Literature on three different frameworks on the teaching of critical thinking skills and other studies related to CT are highlighted.

### 2.1 Definitions of Critical thinking

The working definition of CT according to the National Council of Excellence in Critical Thinking and Instruction is 'the intellectually disciplined process of actively and skillfully conceptualizing, applying, analysing, synthesizing or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning or communication as a guide to believe an action.' (Binker 1992: 84)

Researchers and practitioners have also provided various definitions of CT. Four of these definitions deserve mentioning. Firstly, Ennis (1987) defines it as 'Reasonable, reflective thinking that is focused on deciding what to think or do'. Next, Mc Peck (1981 a.) defines CT as 'the skill and propensity to engage in an activity with reflective skepticism'. According to Angelo (1995), the most formal definitions characterize critical thinking as the intentional application of rational higher order thinking skills, such as analysis, synthesis, problem recognition and problem solving,

inferences and evaluation. Finally Lipman (1988) defines CT as a 'skillful, responsible thinking that facilitates good judgement because it relies upon criteria, is self-correcting and is sensitive to concept'.

The definition of Lipman provides a clear framework of the underlying concept of CT. This definition states that in order for one to be critical in thinking, one has to follow a set of criteria and form good judgement based on these criteria.

## 2.2 What is thinking?

Edward De Bono in his book *Teaching Thinking* mentions that there is no one satisfactory definition of thinking, since most definitions are satisfactory at one level or other. He mentions that the definition of thinking as 'mental activity' is correct, since it covers everything, but it is not very helpful. On the other hand, a definition of thinking as 'logic and reason' is correct but covers only one aspect. He therefore, concludes that thinking is the 'deliberate exploration of experience for a purpose'. That purpose may be understanding, decision-making, planning, problem solving, judgement, action and so on.

In education, the important components are knowledge, intelligence and thinking. Intelligence is an innate quality that depends very much on genes, early environment or a combination of the two. Thinking is the operating skill through which intelligence acts upon experience. Knowledge or information is the basic

material handled by thinking. Thinking is regarded only as a tool for assimilating information, classifying it and putting it into its proper place. Information is very much easier to teach than thinking. Information can be tested in examinations, in an objective manner. However, thinking may seem to be mere guessing. Therefore, the ability to generate thoughts and to link them together in a coherent way definitely involves a degree of thinking skills, but in itself it is no more than a skill in linking together a number of ideas in a grammatical order. Nevertheless, it would be wrong to assume that a skilled language user is a skilled thinker. It would be wrong to assume that a person poor in oral proficiency is poor in thinking. We need language in order to let other people know what we are thinking, but grammatical coherence is not itself the same as thinking.

It is difficult or even impossible, to assess the thinking of a person who is unable to express it in language, but that does not mean that one has no thinking skills. It is, however, essential to decide whether thinking is a learnable skill. In other words, is thinking a skill that can be improved by practice and direct attention or is it an innate ability?

The answer to the above question is that one needs both these dispositions in order to think. One needs direct attention to improve one's thinking process. However, language becomes the vehicle to express one's thoughts.

## 2.3 Teaching Critical Thinking

In this section, three aspects, namely the goals of teaching CT, the roles of teachers teaching CT and the problems involved in teaching CT will be discussed.

Critical thinking has been given focus in the high school and college curriculum in most of the core subject areas. Knowing a subject area remains the primary goal of secondary and college teaching. However, knowing how to use information to discover further information or to solve problems has become increasingly important. In the Malaysian setting, the inclusion of creative and critical thinking skills in subjects such as history, science and mathematics has gained prominence recently.

The challenge in today's curriculum is to teach students to manage their work on their own. A teacher standing at the front of the room cannot teach thinking strategies. Instead, thinking strategies must be learned by individual students, working cooperatively or alone, to make sense of course material. In the local classrooms, teachers are encouraged to have 'brainstorming' sessions with their students. This is in a way to encourage students to think of all the possible avenues to a topic or a problem. Therefore, this shift in classroom focus from 'teacher work' to 'student work' has a profound effect on student morale and motivation. Furthermore, this strategy gives students a sense of ownership in the acquisition of knowledge. It also helps students to retain information in



meaningful situations, which could enhance the retention of knowledge longer in their memories.

Teaching thinking across the curriculum does not relieve the teacher of the responsibility of knowing the subject. On the contrary, teachers are required to have greater knowledge of the curriculum content, because of student inquiry. Students, once given an opportunity to ask and find out more about some issues, would not know their limits. Questions such as 'What does it mean?', 'What difference would it make?', 'How does this connect?', 'What if?', would most probably change the nature of what teachers must know. (Clarke et al, 1993: 2)

Thinking is very often referred to as a process by which the human mind manages information to understand established ideas, to create new ideas or to solve problems. On the other hand, critical thinking is a planned movement in the mind. In order to think critically about a subject, a student must first develop a purpose for thinking. 'Critical thinking requires deliberate movement through planned steps towards some outcome'. (Clarke et al, 1993: 5)

Therefore, the whole process of critical thinking is a planned activity that involves reasoning and evaluation related to a particular issue. As such, critical thinking may not happen without much effort and one has to be trained or exposed to the skills involved in thinking critically. In the final analysis, teachers would have succeeded if they have created 'thinking minds' amongst their students. Students on the other hand would be

considered successful, if they could differentiate the pros and cons, or the strengths and the weaknesses of a problem or an issue.

Coles and Robinson (1991) have suggested that teaching thinking cannot mean only imparting particular skills as, this would mean that people are regarded as skilled thinkers even though they may never, or rarely use the skills. Being merely proficient is not enough; there must also be a tendency to exercise that proficiency. Therefore, most programmes 'work on the basis that one must not only teach skills but one must also encourage the disposition to use them'.

Paul, an advocate of the critical thinking movement is a leading exponent of this view, a view he explains as follows:

'... we became rational to the extent that our beliefs and actions are grounded in good reasons and evidence... to the extent that we have cultivated a passion for clarity, accuracy and fair-mindedness. These global skills, passions, dispositions, integrated with a way of acting and thinking, are what characterize the rational, the educated and, in my sense, the critical person'. (Paul, 1992: 6)

Teaching thinking is a 'humanistic endeavour', which represents an enrichment of the individual that needs no other justification. If research carried out in schools to study the effectiveness of teaching a thinking programme, it does not provide evidence that there has been improvement of thinking capabilities, then there could be reasons for this

situation. One could be that teachers presently have no expertise in this area. Furthermore, a particular programme may not be well designed, or it could simply be that the research is inadequate.

Nagappan (1998) mentions that teachers lack in at least two aspects, particularly in thinking skills that are required for constructing the pedagogical content knowledge needed to teach thinking skills. Teachers find it difficult to construct pedagogical content knowledge to teach higher order thinking skills, as they have to know more about higher order thinking skills and also the instructional strategies to infuse thinking skills in their language classes.

However, there is evidence to show that teaching thinking programmes will in some measure, increase such things as pupils' power of judgment, reasoning, memory, attention and motivation. In the evaluation of the programme devised by the Institute for Advancement of Philosophy for Children (Lipman and Shipman, 1979), Lane and Lane (1986) state that as, 'The results indicated a significant improvement in formal reasoning and in creative reasoning, that is the capability to generate new ideas to discover feasible alternatives, and to provide reasons. The teacher's appraisal was that children were markedly more curious, better oriented, better able to reason, and that their communication skills increased', (1986: 265). Lane and Lane (1986) also note other evidence, that is, the programme can lead to improvements in formal and informal logic, critical thinking, fluency and flexibility of thought, reading, interpersonal relationships and social skills.

Teaching thinking can help such developments by enhancing the tactical repertoire that pupils can draw on in their thinking and by offering the opportunity to look explicitly at that repertoire.

Meyers (1986), emphasises that students must actively practise critical thinking by progressing through a series of increasingly difficult thought processes. Before students can develop a framework for critical thinking in any discipline, they must master the discipline's basic terms, concepts and methodologies and only then serious probing, questioning and analysis can begin. Critical thinking skills develop best in an atmosphere of dialogue, interchange and problem solving. Students do not learn much about critical thinking merely by listening to lecturers. In 1929 Alfred North Whitehead, suggested that the real fruits of education are the thought processes that result from the study of a discipline, and not the information accumulated. (Meyers, 1986: 2)

The need to develop students' thinking abilities is being addressed in both a growing literature on critical thinking and recent innovations in curriculum. Lipman's innovative programme 'Philosophy for Children' (1976), seeks to help young students develop the basic skills and attitudes needed for raising questions and thinking analytically.

In Western culture, critical thinking has traditionally been closely identified with the discipline of logic. Logic formed an important part of classical model forms from which American education is derived. Though the term "critical thinking" was not much

in vogue in those days, the teaching of various forms of arguments, syllogisms, proportional reasoning and other logical operations are clearly seen as necessary to produce graduates with keen thinking abilities, appropriate to their chosen professions and standing in society. However, recent studies have suggested that there is little carry-over between the understanding of the skills of logic and the application of good critical skills in other disciplines. (Mc. Peck, 1981a)

Teachers often complain about students' poor performance in a particular skill and attribute this weakness to poor teaching by their previous colleagues. In the same way, if students can be channelled into courses in logic or problem solving, other teachers could take a related stand, because the difficult task of teaching students how to think has already been done elsewhere. However, this should not be the case, as Meyers (1986) mentions that teachers in all disciplines play a crucial role in the development of students' critical thinking abilities. He further mentions that whatever specific approach is used, 'a teacher must present some explicit perspective or framework for disciplinary analysis - a structure for making sense of the materials, issues and methodologies of the discipline being taught...' (Meyers, 1986: 5)

In classrooms and homes that discourage attitudes of inquiry and skepticism, children quickly learn to remain silent rather than risk embarrassment and disapproval by asking questions that teachers or other adults may consider stupid. However, if students' interest has been captured, through the teachers' encouragement and motivation, it must

be sustained and built upon. Creating a highly interactive classroom environment could do this.

'Students cannot be mere sponges, absorbing the wisdom of a teacher's lecture. Rather, they must realistically engage subject matter and actively practice the act of critical thinking'. (Meyers, 1986:9). Meyers explains that learning to think critically involves expanding one's thinking processes by moving beyond naturally egocentric attitudes and perceptions and immediacy of concrete experience. In the early part of an individual's life, thinking is usually based on his limited life experience. On the contrary, an important ingredient of critical thinking is the ability to make sense of new experiences and to envision possibilities outside one's immediate experience.

One of the primary aims of college education is to move students from a self-centred universe, based on limited personal experiences and concrete realities, to a rather more abstract realism where a multiplicity of values, visions and varieties exist. This is similar to what John Dewey called 'reflective thinking', whereby students have to suspend judgment, maintain healthy skepticism and exercise an open mind. In order to achieve the above status, one requires a fair sense of maturity.

Piaget's learning theory stresses the importance of social transmission in the development of new mental structure. Lecturing is obviously a very comfortable mode of teaching. This could be witnessed because of its long tradition and continued predominance till today. However, the main problem with the lecture mode is that it

disallows students to interact with and process subject matter. More often, there would be furious note taking sessions but this is no substitute for processing information by thinking out aloud, restating concepts in one's own words, discussing issues with fellow friends, or challenging a teacher's assumptions and conclusions. A study by Smith (1977), using both the 'Watson - Glaser Critical Thinking Appraisal Test' and the 'Chickering Critical Thinking Behaviour Test', demonstrated that student participation, teacher encouragement and peer interaction correlated positively with improved critical thinking scores. Teachers might do better to begin each presentation with a question and a brief period of discussion rather than end presentations with questions. Eble suggests that 'the crafty teacher will not let students to become simply passive sponges, but will fool, deceive and trick, all in the interest of getting students to question, to find out for themselves, to respond to the complexity of the world'. (1983: 57)

In spite of all the positive elements mentioned about the teaching of CT, there are six common problems related to teaching. The first problem addresses the issue of the authenticity of training tasks. Students often fail to transfer skills acquired in school context to real-life contexts. Therefore, it is suggested that classroom work should include the addressing of real world problems, as opposed to focussing on artificial exercises.

The second problem is the difficulty to transfer CT, whether it is taught in a general or specific mode. There are differing views on this issue. One may adopt the subjects-specificity view. Their argument is that domain specific critical skills exist, but generalizable general thinking skills do not. The second subscribes to the generalizability view. They believe that general principles of CT exist and that CT should be taught

separately from the standard subject area, for example informal logic course in philosophy. The third group shares the integrative view. They perceive CT as a combination of a set of general dispositions and abilities, together with specific experiences and knowledge within a particular subject matter area. Therefore, they feel teachers should teach general CT principles both as separate and infused courses with the existing subject-matter instruction, where the general principles would be applied.

Thirdly, it is a challenging task to estimate students' developmental readiness. Students' abilities to understand and master critical thinking vary with age. It is not clear what developmental constraints exist for different groups of students and in what ways teaching CT can attend to the constraints.

The fourth problem is, it is essential to understand students' prior knowledge. An individual's familiarity with a subject matter plays a critical part in a person's performance in thinking tasks in that area.

Fifthly, teachers of CT should have a profile of students' characteristics when teaching CT. Factors such as intellectual ability, gender, cultural and socio-economic background have been investigated in relation to the degree to which different groups of students show or have difficulty in mastering CT.

Sixth, there is a general agreement that teachers need to be trained in CT dispositions and skills in order to be able to teach thinking effectively (Lipman 1988). It is



rather challenging for a teacher to have multiple roles as that of a decision-maker, thinker, coach, mediator, model and learner.

The issue of classroom techniques that are needed to teach CT is the subject of the next discussion. A CT classroom encourages the acceptance of divergent perspectives and free discussion. The focus is in giving reasons for opinions rather than only giving appropriate answers. Group work discussion, cooperation and teacher questioning are important elements of teaching CT. Some of the techniques commonly used during teaching CT are problem solving, seminars through conference-negotiations, case study, inquiry, and classroom assessment of a particular issue.

#### 2.4 What are reasoning skills?

There are different ways to conceptualize cognitive skills such as thinking and reasoning. Two methods used are the interpretive exercise and essay question. These methods are emphasized as the preferred approaches when using a pencil and paper test, to assess these skills.

According to Macmillan (1997), reasoning targets were defined 'as the use of knowledge for reasoning and problem solving'. This suggests that reasoning is something students do with their knowledge, a kind of cognitive or mental operation that employs their understanding to some end.

'Reasoning is more than recall, comprehension or simply application'. (Mcmillan, 1997). Reasoning involves some kind of 'mental manipulation' of knowledge. The task is to employ knowledge to interpret and draw inferences, solve a problem, make a judgement or decision, or engage in creative or critical thinking. Thinking is not normally content free. There are three components to reasoning. According to Mcmillan (1997), these components are mental skill, procedural knowledge and the task itself. These three ingredients differentiate cognitive skills such as analysis, comparison and discrimination from the problem solving or interpretative task. Teachers are generally interested in teaching and assessing students on their ability to perform certain types of mental operations, such as analysis or deductive logic. However, teachers do not normally test these skills directly. Teachers are usually interested in the use of these skills to demonstrate understanding or perform problem-solving tasks in subject matter areas.

Assessing reasoning skills is challenging because it is difficult to define the target. It is important to teach and test 'higher order thinking skills' or 'reasoning skills' but operationalizing these general ideas into specific assessment targets is not a straightforward event. The literature on thinking and reasoning identifies three distinct conceptualizations, each based on a different academic discipline. Psychologists have focussed on the application of problem solving strategies and processes. However, philosophers have contributed to our understanding of deductive and inductive logic and to what is called 'critical thinking'. On the other hand, educators have emphasized mental skills as illustrated in Bloom's taxonomy. Each of these disciplines has had a different focus. Nevertheless, these disciplines have been labelled as 'thinking skills'.

## 2.5 The Concept of Argument

In everyday language the word 'argument' is used in many ways and in different context. Sometimes it refers to a type of interaction as what we say 'they are having an argument'. Sometimes it is described as 'quarrels' or 'squabbles'. These kinds of arguments usually involve two or more persons extended in overt disagreement with one another.

Another concept of argument refers to 'making an argument', offering a claim and giving support for it, as in 'Cindy argued that Rebecca might not adapt well to an interpersonal learning environment'. This view considers whether an argument is sound and effective it emphasizes argument as a reasoning process and considers arguments as units rather than an interactive process.

According to Warnick and Inch (1994), 'an argument is a set of statements in which a claim is made, support is offered for it, and there is an attempt to influence someone in a context of disagreement'. This definition emphasizes the context of what is said and the connections made among the statements making up an argument.

There are three features of an argument. Firstly, if a statement is to be considered to be an argument, it should make a claim. A claim is an expressed opinion or a conclusion that the arguer wants to be accepted. Claims take on various forms and labels

depending on the circumstances and situations in which they are made. For example: in writing, the thesis statement may serve as a claim, however, in a debate, the resolution functions as a claim, and in criminal law, the charge brought against the defendant may be viewed as a claim. According to Warnick and Inch (1994), 'claims challenge the beliefs or opinions of others, they require support in the form of reasons and information, whereas other kinds of statements do not'. (1994: 27)

The second characteristic of an argument is that support is offered for the claim. Claims are supported by evidence and by reasoning or inferences that connect the evidence to the claim. Evidence consists of facts or conditions that are objectively observable beliefs or statements are generally accepted as true by recipients or conclusions previously established. Claims are also supported by the link that the arguer makes between evidence and the claim. The part of the argument containing reasoning is frequently called inference.

The last characteristic of arguments is that they are attempts to influence someone in a context where people disagree with each other. The phrase 'attempted to influence' is important because the arguer may or may not succeed.

## 2.6 The relationship between argument and CT

Argumentation is the process of making arguments intended to justify beliefs, attitudes, and values so as to influence others. Argumentation is only one part of the persuasive process. Its role is to convince others through sound reasoning and good evidence that a particular value or viewpoint should be adopted. Persuasion as a whole has other dimensions besides arguments. One of these is source credibility, or whether the audience perceives a message source to be competent and trustworthy. Other dimensions of persuasion relate to emotional appeals and the use of style.

CT, on the other hand, involves the ability to explore a problem, question or situation, integrate all the available information about it, arrive at a solution or hypothesis and justify one's position. CT involves many specific skills – namely analysing and evaluating evidence, identifying relevant questions, drawing sound inference, generating plausible solutions and hypothesis, detecting errors in others' reasoning, stating implicit assumptions and understanding the implications of an argument.

## 2.7 Evaluation in teaching

Bachman (1991:54) mentions that 'evaluation comprises essentially two components namely information and value judgements, or decisions. The information relevant to evaluation can be either qualitative (non-measurement) or quantitative

(measurement).’ Evaluation can be defined as the systematic process of collecting and analysing data in order to determine whether and to what degree, objectives have been, or are being achieved. In this study for instance it is to find out to what extent, one of the objectives of the WS component has been achieved.

There are two reasons for evaluation. Firstly, it is for the purpose of accountability and secondly for the purpose of programme development. Accountability refers to the answerability of staff to others for the quality of work. ‘Others’ in this context refers to the bureaucrats, employers, senior school staff, parents, students, the community or the taxpayers. In this study, both the reasons can be accepted as a cause for concern.

Evaluation is a continuous process and it is not what you do “at the end”. Evaluation should be planned for prior to execution of any effort. There are two types of evaluation, namely standard evaluation and curriculum evaluation. Standard evaluation is when one thinks of student evaluation, one would probably think of achievement. Achievement is, however, one of the many variables on which a student is assessed.

Curriculum evaluation involves the evaluation of any instructional program or instructional material and includes evaluation of such factors as instructional strategies, textbooks, AVA materials and physical and organizational arrangements.

The evaluation process entails decision-making. Any educational endeavour involves a whole host of decisions which must be made, decisions about objectives,

decisions about strategies, decisions about measurement and so forth. Each phase of evaluation involves different kinds of evaluation. The planning phase deals with 'What will we do?' questions. The process phase would ask 'How are we doing?' and the product phase is concerned with 'How did we do?'

## **2.8 Ennis's Taxonomy of CT: dispositions and abilities**

Critical thinking is defined by Ennis (1987) as 'reasonable reflective thinking that is focussed on deciding what to believe or do'. He notes that CT involves higher order thinking skills, but the act of thinking critically must include a decision or judgement about a belief action or answer, as well as appropriate dispositions.

CT is being able to carefully analyze a knowledge claim or information to judge its merit and worth in relation to the action or belief that results. Dispositions refer to a frame of mind that is important for CT such as being willing to remain open-minded, a desire to consider all viewpoints, seeking clear statement of the problem or question, and striving for unbiased information.

In order to promote 'reasonable' thinking in making judgements, Ennis (1987) lists a number of abilities that should be employed. Assessment of CT as reasoning begins with identifying the task and the judgement that the student needs to make. Essay-type test questions are best for this type of assessment because students can be asked to defend their judgements or answers.

Ennis has identified twelve aspects that could be labelled as CT skills. The first one is 'grasping the meaning of a statement'. One is expected to find out if a statement was meaningful or otherwise. The next aspect is judging whether there is ambiguity in reasoning. In this case, one has to determine if a particular statement is clear.

The third aspect is judging whether statements contradict each other. Here, it is to see the consistency of the statements. The fourth aspect is to judge whether there is a necessity for a conclusion. In other words, one has to determine the logical aspect of statements.

The fifth aspect is to judge whether a statement is specific enough or otherwise. Here, it is to find out if the statements are precise or not. The sixth aspect is judging whether a statement applies a principle. In this case it is to find out if a particular statement is following a rule or pattern.

The seventh aspect is to judge whether an observation statement is reliable. This aspect, it is to find out the accuracy of an inductive conclusion. This means that there is a justification for this form of conclusion.

The eighth aspect is to judge whether an inductive conclusion is warranted. In this case it is to find out the justification for making a conclusion.



The ninth aspect is to judge whether the problem has been identified. This is to find out the relevancy of a problem. The tenth then is to judge whether something is an assumption. This is to determine if something has been taken for granted.

The eleventh aspect is to find out whether a definition is adequate. It is to determine whether a statement is defined well. Finally, the last aspect is to find out whether a statement taken on authority is acceptable. It is to determine the truth of a particular statement.

Having mentioned all the twelve aspects in Ennis taxonomy, it would be interesting to see how these aspects differ from Blooms's Taxonomy (1956). Bloom and his associates consider the term 'critical thinking' as being synonymous with 'evaluation'. In Bloom's taxonomy evaluation is the highest of the six thinking skills, which he calls the 'cognitive goals' of education. Judging by Bloom's taxonomy, he has placed CT as the highest order in cognition. However, Ennis (1987) has developed the twelve skills that one has to go through, to reach the state of evaluation. In a nutshell, Ennis has defined CT in great detail by spelling out the operations involved to achieve the target. However, Bloom has merely mentioned that evaluation is the highest order of thinking skills without mentioning the process involved in order to achieve it.

## 2.9 Quellmalz's Framework for Reasoning skills

The next discussion on critical thinking is based on 'Quellmalz's Framework for Reasoning Skills'. Quellmalz (1987) conducted an analysis of the different ways of conceptualizing thinking and reasoning skills. She concluded that the various frameworks contained five common elements that make sense for teaching and assessment: recall, analysis, comparison, inference and evaluation.

Recall is quite similar to Bloom's knowledge and comprehension categories. It refers to verbatim repetition, translation, or identification. Analysis is used in essentially the same way as it is in Bloom's taxonomy. In this operation, students divide a whole into component parts. This includes identification of the parts, the relationships among different parts, and the relation of parts to the whole.

The third element, comparison, is concerned with reasoning about similarities and differences. This skill is one in which the student compares, contrasts and relates. Comparison is contained within Bloom's analysis category, but Quellmalz separates it out because often students are asked to first analyze and then compare.

Inference requires deductive or inductive thinking. In a deductive task, students are asked whether one thing follows from another. Inductive reasoning involves reaching a reasonable conclusion or generalization from information provided. Other thinking skills that require inference include hypothesizing, predicting and synthesizing.

In the final type of reasoning, which is evaluation, students express or defend an opinion, judgement or point of view. This is essentially the same as CT. Students justify, explain, argue and criticize verifiable facts from value claims. The student tries to determine the credibility of a source and distinguishes relevant from irrelevant information, claims or reasons and detects bias. The third step is to make inferences. At this point, a student would recognize logical inconsistencies in deductive reasoning. He would also recognize unwarranted claims or generalizations from inductive reasoning. The fourth step is to conduct advanced clarification. At this juncture, a student would identify unstated assumptions and identify ambiguous or illogical arguments. He tries to determine the strength of an argument, detects inconsistencies, detects stereotypes and considers alternative judgements. He would also try to distinguish cause and effect from relationship. The final step is to make a judgement. Here, a student would decide on an answer, solution or course of action. In order to determine if students are able to use particular abilities in making judgements, one could design a paragraph that includes unreliable or biased sources of information. If students make their judgements without taking into consideration limitations due to the unreliability or bias, then it can be concluded that this aspect of their CT is weak. Essay-type test questions are the best for this type of assessment because students can be asked to defend their judgements or answers. However, objective items are also useful in detecting whether students realize that, for instance, a specific fact presented is irrelevant.

The appeal of Quellmalz's work is that the types of reasoning are easily applied to different subjects. However, the limitation of this framework is that the emphasis is on the cognitive skills rather than tasks such as problem solving or CT.

## **2.10 Marzano's dimension of Learning**

Marzano (1992) offers an instructional framework for organizing learning outcomes into five major categories. Each category represents a type of thinking that is important for successful learning. The dimensions of learning framework were initially developed to show teachers how to use recent research and theory on learning, particularly constructing ideas, to organize plan and execute instruction.

The first dimension deals with positive attitudes and perceptions about learning. The second is related to arguing and integrating knowledge. The third dimension is related to extending and refining knowledge. The fourth is using knowledge meaningfully. Finally, the last is productive habits of mind.

The first and the fifth dimensions are concerned with the affective domain. The second learning dimension, acquiring and integrating knowledge, includes the distinction between declarative and procedural knowledge. Dimension three and four are referred to as complex thinking or reasoning skills. Dimension three is extending and refining knowledge, which emphasizes how students use thinking skills to extend and refine knowledge to demonstrate understanding. This includes inductive and deductive thinking,

analysis and making comparisons. Dimension four, using knowledge meaningfully, includes most of the reasoning tasks. Here, students use their knowledge to make decisions, conduct an investigation, solve a problem and develop something unique. The frequently used dimensions by teachers are decision making and problem solving.

Problem solving and decision making are pertinent skills in critical thinking. Problem solving involves finding a solution that overcomes some kind of obstacle. This involves identifying the problem, developing possible solutions, testing solutions and finally evaluating them.

Decision-making is similar to problem solving but it may or may not involve obstacles or constraints. In decision making, students need to understand the desired goal or result, evaluate the alternatives in terms of the criteria related to the situation and select a plan, task, course of action or make a choice on the basis of the evaluations.

Dimensions three and four are very much inclined to critical thinking skills. Therefore, for the purpose of discussion, Marzano's dimension three and four would be referred to extensively. Both the dimensions have the following thinking processes. These processes are as follows:

- 1) Comparison which involves describing similarities and differences between two or more items.
- 2) Classification, which involves organization of items, based on specific characteristics.
- 3) Induction which involves creating a generalization from information.

- 4) Deduction which involves describing logical consequences of generalizations or principles.
- 5) Error-analysis which identifies and describes specific errors, information or processes.
- 6) Constructing support, which develops well-articulated argument for or against a specific claim or assertion.
- 7) Abstracting identifies underlying theme or pattern from situation or information.
- 8) Analyzing perspectives is considering opposing positions and the reasoning that supports each position
- 9) Decision-making is to make a selection among apparently equal alternatives.
- 10) Investigation is to examine and systematically inquire about something.
- 11) Problem solving is to develop and test a method or product for overcoming obstacles or constraints to reach a desired outcome.
- 12) Experimental inquiry is to test hypothesis that has been generated to explain a phenomenon.

In this study, Marzano's complex thinking or reasoning strategies would be the basis of reference for analyzing the past years WS Examination questions. Reasoning can be measured by objective items and recall knowledge can be evaluated in student essays or performance based product. Normally, when we assess reasoning we are also measuring how much students know. In the case of assessing WS examination questions content is marked upon 80% and language is marked upon 20%.

central concepts and issues and summarizing these from readings and related materials. Summarizing new materials involves processing concept and issues in terms of one's own experience and understanding. From the methodology point of view, summaries are great tools for teaching CT, because they provide practice in identifying main issues and concepts and offer opportunities for prioritizing information (Gremore, 1982).

Next, short analytical papers can have the value of being used as building blocks to teach the constituent skills of a large CT process.

One of the more challenging aspects of teaching CT is helping students comprehend appropriate abstract concepts and principles. Problem solving exercises built around newspaper and magazine articles are one of the most creative and productive forms of teaching CT skills.

Newspapers and magazines provide a variety of excellent opportunities for drawing analogies and relating everyday experience to more abstract concepts studied in the classroom. Students tend to believe that everything that appears in print is 'objective' news reporting and therefore it must be true.

However, exercises that force students to raise questions regarding point of view, opinions, or bias in the popular press can help to dispel this illusion and help students in developing a healthy skepticism about the printed word.

Another way to help students apply classroom theory to practical experience is to assign short projects to be done outside of class. The assignments should be brief enough

to be completed between class sessions with minimum props or equipment. However, designing exercise of this nature may pose some problems. Students should be adequately prepared to complete the task. Teachers should be clear regarding the exact purpose of each exercise. Therefore, to ensure desired outcomes, it would be best to provide a structural format for outside exercises.

A weakness of many college writing assignments is the lack of a 'real world' context. In order to have a successful writing endeavour, it is important to have a realistic context. This would help the writer by providing crucial background information that would help the writer decide what to write about and how to go about with it (Gremore, 1982).

Written assignments are valuable to the instructor because they reveal, at least in part, what students' thinking processes are like. Teachers going over papers with students, help the students to see more explicitly their own thought processes and thus become more aware of their progress in developing CT. However, the setback is large class size often prohibits teachers from giving individual attention. In that case, meaningful, constructive comments will have to be provided as feedback.



## 2.12 Other Research Findings

This section intends to view and discuss some of the other research findings on the teaching of CT. However, there were not many studies in this area as such. Nevertheless, some current and meaningful studies have been considered for discussion.

Egbert mentions that the 'business community in particular has considered CT a vital skill sorely needed in today's economic climate' (Egbert, 1998:19). This strong statement indicates the importance of CT in making decisions that may decide the future of one's economy. The implication is, if a wrong decision is made, it would jeopardize the profits of a business enterprise.

According to a poll carried out by the Bayer Corporation in 1996, 'students seeking to enter the workforce nowadays, lack the skills of judgement and CT to become successful employees.' (Egbert, 1998:19) Here again the results of the poll emphasises the importance of CT and also implies that without it, a person seeking employment may lack skills in judging something.

In this study, the authors have used Ennis's (1997) definition of CT as 'reasonable reflective thinking that is focussed on deciding what to believe to do'. They further elaborate that CT goes beyond the human mind's effort simply to understand information. They also mention that a critical thinker creates his or her own ideas about a given topic and provides solution to the problem at hand. (Egbert, 1998:19)

Kreber, (1998), mentions that 'the ability to think critically and the willingness and capacity to engage in self- directed learning are considered important prerequisites for lifelong education' (1998:71). According to the Kreber(1998), research on self-directed learning and CT, to date has largely ignored individual differences among learners. In the research carried out, it is noted that there is a significant relationship between self-directed learning and CT. It further mentions that educators can foster competence in self-directed learning by providing opportunities for students to develop both their intuition and logical reasoning skills.

The next study that is to be discussed is particularly related to this study. It is an in-house study carried out at Maktab Perguruan Ilmu Khas in 1994. The strategies are related to the component of 'World Studies', which was taught to the Matriculation students. The purpose was to investigate students' response to teaching strategies of World Studies in the Matriculation Programme. The findings were analysed in relation to content input provided by WS lecturers, skills students have developed through their WS, and WS strategies preferred by students.

According to the survey carried out, students felt that the WS tutors had encouraged them to read widely and develop independent reference skills for the given topics. They had also been encouraged to incorporate local, world and current issues in their discussions. Despite the fact that tutors encouraged students to do independent reading and referencing on topics discussed in class, not all students felt that content input provided by tutors was adequate.

The next aspect was regarding skills that have been developed during the WS classes. Some of the fundamental skills the WS tutors taught during WS classes were information gathering skills, analytical and CT skills, presenting, developing and defending opinions orally or in writing and analyzing and evaluating arguments presented by peers and lecturers. A large percentage, about 82.7% of the students indicated that they had mastered information-gathering skills in the World Studies component. 49% of the students felt that tutors had helped them to develop skills in critical analysis and evaluation. These students felt that they had seldom been encouraged to challenge and question opinions presented by peers or tutors. If the above data is studied in detail, it implies that gathering information has a greater impact than developing skills in critical and analytical thinking. Ironically, one of the main objectives of the WS component is developing critical thinking skills. The implication is, generally students feel that they have not mastered this objective satisfactorily.

The citing of the above cases and experiences are in a way relevant to this study. This is because the issues raised and the conclusions drawn from these studies indicate the importance of teaching CT skills.